

## REPORT ON THE STATUS OF THE APXS ON MARS PATHFINDER MISSION.

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Last year was a very busy time for the Alpha-Proton-X-Ray Spectrometer (APXS) team. After the delivery of the flight instruments for the Pathfinder, and the Russian Mars-96 missions, most of the time was spent integrating the APXS with the microover and solving the noise problem arising from the unusual large ripples of microover power supply to the APXS. This noise problem was so severe that it made the APXS spectra totally unusable for any analyses. After long investigation the noise problems were resolved by additional filtering and shielding the most sensitive components of the APXS.

Last May, two set of radioactive Cm-244 alpha sources were received in Chicago from the Reactor State Scientific Center in Dimitrovgrad, Russia. One set of nine sources, with a total activity of 44 mCi, was installed into the flight instrument. The second identical set is used at the University of Chicago to calibrate the laboratory instruments to derive the APXS library that will be needed for performing the data analyses of the Martian samples. Both sets of the alpha sources are very good in terms of stability and energy resolution. The stability is particularly gratifying because it made the source handling and

installation into the flight instrument at the Kennedy Space Center easy and preventing any contamination incident. Fig.1 is the energy spectrum of all nine sources installed into APXS flight instrument.

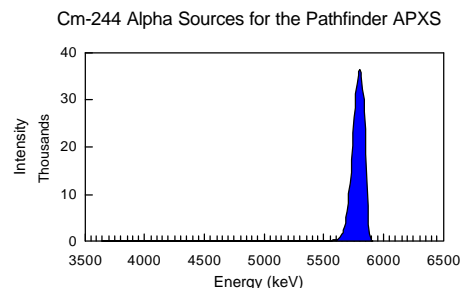


Fig.1

After the final installation and verification of the flight instrument, work started with the laboratory unit. Spectra of pure elements and many chemical compounds were obtained in the laboratory. Many standards of known composition and many samples of unknown composition were measured and will be analyzed in order to establish the accuracy and detection limits for all the elements by the APXS.

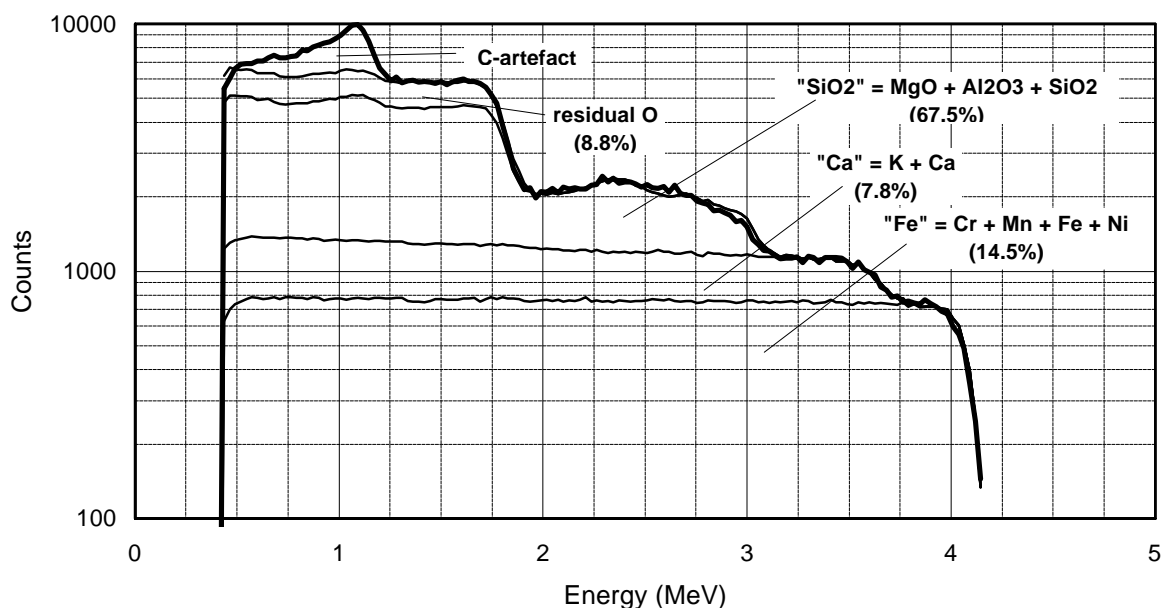
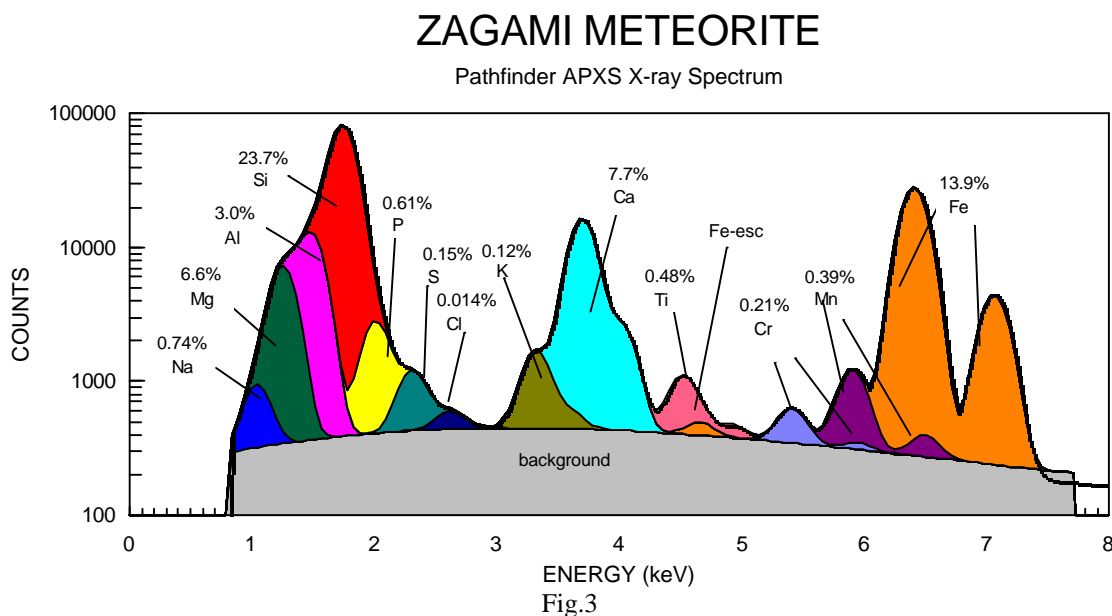


Fig.2

Fig.2 shows the alpha measured spectrum of the SNC meteorite Zagami and its elemental constituents. The artifact at the carbon endpoint is the result of polypropylene substrate during the analysis because of the small size of the sample. The alpha mode is particularly good for determining the amounts of light elements like carbon and oxygen and also enabling for absolute elemental abundance determination. Similarly, Fig. 3 shows the measured X-ray spectrum of the same meteorite and the deconvoluted individual contributing elements. Also shown is the elemental composition of the Zagami meteorite as was analyzed by standard laboratory techniques in Mainz (G. Dreibus-

private communication). The X-ray mode provides excellent separation for the heavy elements but lacks the resolving ability for the light elements where the opposite is true for the alpha mode. The complimentary nature of these two modes together with the help from the proton modes enables the APXS to provide an absolute and accurate chemical composition for all the elements (except H and He). The accuracy and detection limits for each element will be determined after calibration completion. The APXS instrument was described in more detail by Economou et al. (1996) and Rieder et al (1997).



The APXS was delivered and installed into the microrover in mid September of 1996.

The installation of the radioactive Cm-244 alpha sources proceeded smoothly and without any hindrance. A final preflight calibration and short time spectra taken with the flight instrument in air showed

normal instrument performance. Shortly after the launch on December 4, 1996, the APXS was turned on and an instrument health check was performed. The instrument responded properly on all the commands from the spacecraft as an indication that the APXS survived the launch. Now, we are looking forward for landing on Mars on July 4, 1997.

References: [1]. T. Economou, A. Turkevich, R. Rieder, H. Wänke: LPSC XXVII, p 1661, 1996.

[2]. R. Rieder, H. Wänke, T. Economou and A. Turkevich : Accepted for publication in JGR 1997.